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A DECISION SUPPORT SYSTEM FOR THE RENEGOTIATION OF PPP CONTRACTS

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Public Private Partnership (PPP) contracts tend to have longer contract durations compared to other conventional procurement methods. A contract renegotiation becomes inevitable in most of the cases. The renegotiation process usually develops a number of scenarios in order to regain the contract equilibrium. The common renegotiation scenarios used are: increasing the service charges, increasing the concession period, or paying a lump sum amount to the party of concern in order to maintain a fixed rate of return and keep the return on equity constant. In this paper, a method of selecting the optimum scenario among the different scenarios is proposed. The aim of this research is to facilitate the renegotiation process by offering an automated system to select the optimum renegotiation scenario that preserves the rights and the interests of the project stakeholders. This is done using a weighted sum model to calculate the weights and ranks of a number of factors influencing the stakeholders' decisions. A Decision Support System (DSS) is developed with the aid of Microsoft Excel 2013, Visual Basic for Applications (VBA) programming language, and the Precision Tree 5.5 for Excel add-in.

Keywords: Dispute, Negotiation, Financial model, Contract re-equilibrium, Spreadsheet.

1 RESEARCH MOTIVATIONS

Public Private Partnership is a delivery method which depends on co-operation between the public sector and the private sector in order to be able to finance mega infrastructure projects. The choice between the Public Private Partnership delivery method and other conventional delivery methods depends on many factors that should be looked at thoroughly. PPP projects are very challenging in terms of attracting investors to enter the bidding process. This is due to several factors; one of which is the private sector's fear of the long-term nature of PPP projects, which makes it extremely difficult to anticipate contingencies along the projects' lifecycles. Due to the lengthy contract durations, the principles and bases upon which the original PPP contract was made may no longer apply; they may be simply altered or totally changed as the project evolves. A different set of conditions and situations may appear later in the project, making the need for a contract re-equilibrium inevitable, and with re-equilibrium comes renegotiation. During the renegotiation stage, conflicts may arise between the different stakeholders of the project. These lengthy renegotiations become full of conflicts that, in some cases, may lead to contract terminations and major losses for several parties. However, those conflicts can be avoided through a pre-agreed renegotiation mechanism. Tools are needed to ease the lengthy renegotiation process. This research provides a tool that facilitates a renegotiation process in which the interests of all parties are considered in the final decision. This tool will help in

attracting the private sector to enter PPP contracts and ensure project continuity and stability of transactions.

2 LITERATURE REVIEW

The time value for money is the difference between the project value that is incurred by the private sector in case of choosing the PPP option and the project value if executed by the public sector. Although the cost of borrowing for the private sector is usually much higher than the cost of borrowing for the public sector, the PPP option, in many cases, may have a higher value for money for several reasons, such as the ability of the private sector to provide better and more efficient services than the public sector (The Construction Management Association of America, 2012). Private sector know-how is another reason for choosing a PPP approach. A value for money study should be conducted to determine whether the PPP option is more efficient in the long run than other procurement methods. In other words, the public sector should only choose the PPP option over conventional procurement methods when the private sector is providing a better service with more efficiency, or when the private sector is providing a higher value for money (VFM). Almost all PPP advantages lead to the same conclusion: a better VFM (Skanska 2004).

Archer and Cameron (2003) published results of a survey conducted by the National Audit Office (NAO) of the United Kingdom. The survey included 37 PPP projects. Cost overruns and time delays were estimated. The results indicated that almost 75 percent of conventional procured projects suffer from cost overruns while less than 25 percent of PPP projects suffer from cost overruns. The study also found that almost 24 percent of PPP projects suffer from time delays. The conclusion showed that PPPs are more efficient in terms of time and cost than conventional procurement methods.

Sarmento and Renneboog (2016) have explained another aspect which is called "off-balance sheet" approach. In their paper, the concept was explained as an advantage to the governments using PPP delivery method. PPP value is not part of the government expenditures listings; in other words, it is off their balance sheet. Hence, theoretically, it will not affect the public debt.

Katz (2006) states that due to the length of PPP contracts, such contracts are usually prone to renegotiation as a result of various unexpected contingencies that might occur along the project lifecycle. In addition, it is very difficult to control the performance of the private sector and its quick response to growing demand, especially when the private sector is paid by the government rather than the user fees method. This may lead to political issues due to the dissatisfaction of the service users. A PPP contract may lose efficiency with time due to the fact that the project cannot be re-tendered, which diminishes competition and the incentive to provide a better service.

Cruz and Marques (2012) has investigated the reasons of contract renegotiation in infrastructure projects. They claim that contract renegotiation is usually a result of contract incompleteness. Cruz and Marques states that in order to have a complete contract, this will result in a very high transaction costs. Hence, instead of working on a complete contract, some rules and conditions are to be agreed in case of renegotiation.

Cruz *et al.* (2014) has stated that the main reasons of renegotiation vary between changes initiated by the government and changes in the expected return of the project. The event which occurs after the award of the project leads to a completely new risk matrix with different allocation of the risks and risk allocation.

In summary, the idea of a PPP is to combine the expertise and resources of the public and the private sectors in order to reach efficiency and VFM, yet PPP if not carefully managed, it can increase the cost of procurement services more than any other traditional procurement method,

(Carbonara *et al.* 2016). The above disadvantages along with insufficient feasibility studies and poor decisions can turn a PPP from an advantageous method of delivering services to the public sector into leading to undesired results.

3 THE METHODOLOGY

This framework is a fragment of a comprehensive research which aimed to developing the re-equilibrium scenarios of PPP, and selecting the optimum scenario which fits both the public and the private sector. However, for the purpose of this paper, the research shall focus on the scenario selection process.

The purpose of this research is to facilitate the PPP renegotiation process by choosing the optimum scenario to satisfy all parties. Stakeholders have different interests and concerns in the renegotiation process; hence, the proposed model will work on finding common ground between all parties in order to reach an optimum renegotiation outcome. This will ensure a fair approach and enhance mutual trust between the stakeholders, which will benefit the project's overall progress. The following framework is to be of great benefit to decision makers in public and private sectors, yet the objective of the proposed framework is not to be a substitute for decision makers.

In PPP projects, events occur that disturb the re-equilibrium of the financial model; in other words, it affects the cash flow of the project which may lead to changing the agreed rate of return of the private sector. In order to fulfill the purpose of PPP projects and return the equilibrium to the PPP financial model, there are commonly used four re-equilibrium scenarios which are: paying a lump sum amount to the private sector, increasing the service charges, increasing the concession period, or a combination of one or more of the above. The scenarios selection process aims to choice between the four re-equilibrium scenarios is made. The goal of the scenarios selection process is to account for the interests of the stakeholders of the PPP project, mainly the public sector and the private sector, when selecting the renegotiation outcome scenario.

The criteria and their corresponding sub-criteria are defined, based on which the selection is to be made. In order to evaluate each scenario, a score shall be given to each scenario. The scenario score is calculated using the weighted sum model. This weighted sum model works by allocating different criteria to each scenario. The criteria will have relative importance to each other. The scenario score shall equal the summation of the weight of importance for each criterion multiplied by its value as shown in Equation 1. (x) is the number of alternatives of scenarios, (i) is the number of main criteria, (j) is the number of sub-criteria of a certain main criterion, (W) is the weights and (R) is the rankings. The following equation should be within where x =1 to 4, i =1 to n, j = 1 to m.

$$ScenarioScore(SS_x) = \sum_{(j=1)}^{m} W_{ci} W_{sj} R_{sj} \quad (1)$$

After inputting the criteria, the model provides the scenarios selection process with the importance of each criteria with respect to the rest of the criteria for each of the four scenarios. The model then determines the weights of the criteria and sub-criteria with respect to the different re-equilibrium scenarios. The approach is to draw matrices for the main criteria and each of the sub-criteria categories in which the top row is the criteria or the sub-criteria and the rest of the matrix is a mirror image. Decision matrices were invented by Stuart Pugh (Pugh 1993). An example of the decision matrix is shown in Figure 1.

The above exercise is done for the criteria and the sub-criteria for each one of the four scenarios, as the weights may differ when dealing with making a lump sum payment or just

extending the concession period. Separate rankings are required from both the public and the private sector in order to reflect their interests and preferences. Using the weighted sum model, eight scenario scores are calculated: four for the public sector, and the other four from the perspective of the private sector. The outputs of this step are the best scenarios or the scenarios with the highest scores from the private sector perspective and the public sector perspective. Then, averages of the private sector rankings and the public sector rankings are taken to calculate the four re-equilibrium scenarios scores from the perspective of both parties. Figure 2 shows the integration between the inputs and outputs of the model. An example of which shall be illustrated in the following section.

	Criteria 1	Criteria 2	Criteria 3	Criteria 4
Criteria 1		Criteria 2	Criteria 1	Criteria 4
Criteria 2			Criteria 3	Criteria 2
Criteria 3				Criteria 4
Criteria 4				

Figure 1. Example of a decision matrix.

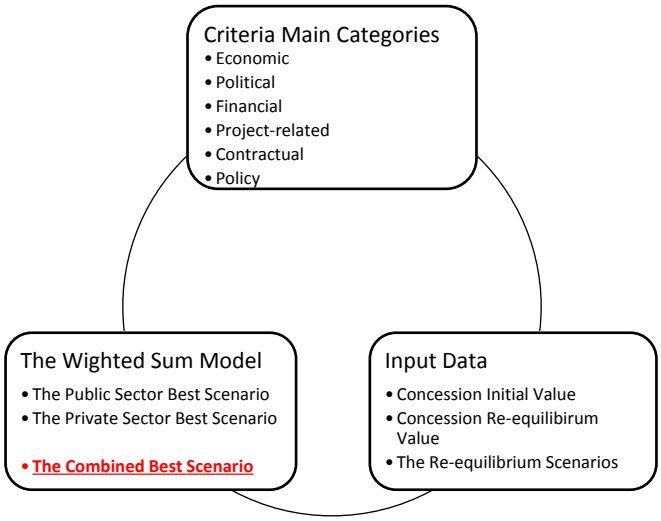

Figure 2. The Integration between the model inputs and outputs.

4 DISCUSSIONS AND ANALYSIS

The previous framework can be applied using computer software. The model is developed using Microsoft Excel 2013, Visual Basic for Applications (VBA) programming language, and the Precision Tree 5.5 for Excel add-in. In order to demonstrate the application of the framework developed, dummy data were used.

The aim of the model is to maximize the satisfaction of both the private and the public sectors. In order to achieve this goal, a set of criteria should be defined in order to evaluate this degree of satisfaction. The criteria main categories are economic, political, financial, project related, contractual, and policy. The economic criteria have to do with the economic situation of the country where the project is located. The sub-criteria for this category include inflation, general conditions of the country, stability of the exchange rates, and how the IRR is affected by

all of the above. This is followed by the political criteria. The sub-criteria include long-term stability of the country, the current political situation, and the justice system in general. In addition, the financial criteria have to do with the party's financial standing. It includes any current financial obligations required to be paid by the party, additional financial obligations, liquidity, the ratio between debt and equity, and the transparency of financial data. On the other hand, the project-related criteria are specific to the project nature, which includes original concession period, preferable concession period, and the level of complexity of the project. Moreover, the contractual criteria include existence of regulator, risk sharing agreement, and how clear the termination clauses and re-equilibrium clauses are. Finally, the policy criteria are the general manner in which a certain party usually reacts to a certain situation. It includes the long-term business strategy, the likelihood of repeated business with a certain partner who is able to recognize the claim, and the experience of other partners.

The weights of each criteria and sub-criteria change depending on its relation to a certain scenario, as explained in the methodology; hence, the model user shall select which is more important among combinations of two criteria with respect to the selected scenario. The model user has the right to select both criteria if he believes that they are equally important. The weights of the criteria or the sub-criteria are calculated by counting the number of occurrences of the criteria or the sub-criteria in the decision matrix and dividing it by the total number of occurrences of all the criteria or the sub-criteria to get a percentage.

There existed separate weights for the criteria and the sub-criteria for each one of the four scenarios. However, the model user is to enter only one rank for all the four. There exist two separate sheets for the private sector and the public sector in order to decide whether these sub-criteria is in favor of the party or not. The following column is related risk, where the model user chooses the risk that affects his decision from a dropdown menu. The ranks are very suitable, suitable, neutral, unsuitable, and very unsuitable. Finally, the scenarios with the highest scores are identified both separately and combined for the public and the private sectors, Figure 3.

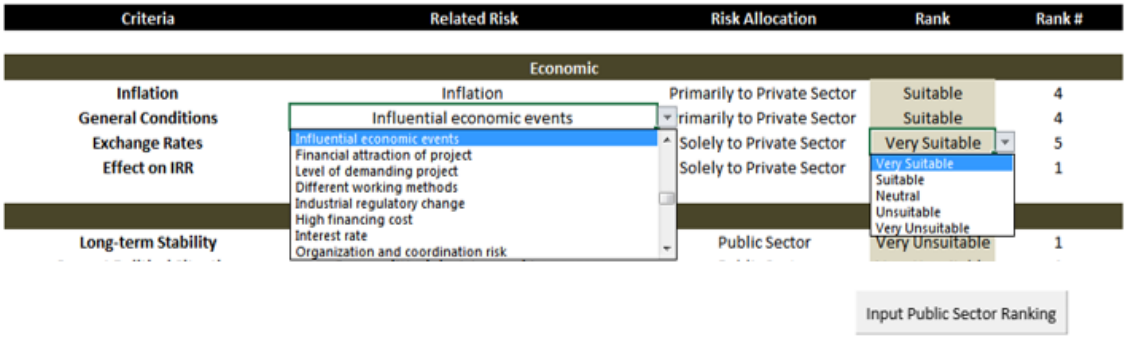

Figure 3. Example of sub-criteria ranking.

The model presents three decision tree reports, each presenting the expected monetary value (EMV), which is another way of calculating the scenario score. The trees start with a decision node, with the four alternatives of scenarios branching from it. Each scenario has branches presenting the criteria, and each criteria branches into the sub-criteria. The branches have the weights, and the rankings are assigned at the end of the tree branches.

The model then develops the risk profile graphs as it shows the risks and opportunities of choosing one scenario over the other. The model produces a probability chart, which shows the effect of changing the weights of the criteria and sub-criteria on the scenario scores, reflecting the

probability of choosing a certain scenario over the other. A cumulative graph is also developed, which presents the ranges of values that the scenario can yield versus the corresponding probabilities or weights. A statistical summary report is then formulated to provide some statistics about all the ranges of possible outcomes of the decision tree.

The model also develops policy suggestion reports, which help the decision maker look at the broader picture when making his decision. The decision table report provides the "benefit of correct choice," which is basically the difference between the value of the highest scenario score and the lowest one. This helps in showing whether the scenario scores are close or not. The policy suggestion reports also include an optimal tree report that shows the path of the optimal decision only.

5 CONCLUSIONS

The purpose of this research is to develop a tool which will assist the re-equilibrium process of the financial model of PPP contract. Re-equilibrium is the process of adjusting the cash flow of the PPP project to return the rate of return of the private sector to the original rate of return at the contract commencement. Contract renegotiation at this stage is necessary to protect the rights of different stakeholders of the project. The model is developed using Microsoft Excel 2013, Visual Basic for Applications (VBA) programming language, and Precision Tree 5.5 for Excel add-in.

The main contribution of this research is that it develops a framework that facilitates the PPP contract renegotiation process. The methodological framework is applied as a Decision Support System prototype model. The purpose of the suggested framework is to enable all contract stakeholders to agree on a unified method of developing the different re-equilibrium scenarios and choosing the optimal scenario that suits all parties. This will facilitate the PPP renegotiation process, which will, in turn, encourage investors to enter PPP projects. The developed framework is of great benefit to project stakeholders, including the private sector, the public sector, and the users of the service. It saves time and money invested in lengthy negotiations, and it enforces transparency and mutual trust between the different parties by providing a tool that significantly minimizes conflicts during the renegotiation process and defines clear steps to be followed in order to reach an agreement that will maximize the benefits for both private and public sectors.

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